PB-234 009

COMPILATION OF INDIRECT SOURCE MONITORING STUDIES

GEOMET, INCORPORATED

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

APRIL 1974

DISTRIBUTED BY:
NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1 REPORT NO. EPA-450/3-74-043	2
	3 PB 234 009
4 TITLE AND SUBTITLE: Compilation of Indirect Source Monitoring Studies	5 REPORT DATE: April 3, 1974
	6 PERFORMING ORGANIZATION CODE
7 AUTHOR(S): John T. MacWaters, Douglas J. Pelton	8 PERFORMING ORGANIZATION REPORT NO: EF-316
9 PERFORMING ORGANIZATION NAME AND ADDRESS: GEOMET, Inc. 50 Monroe Street Rockville, Maryland 20850	10 PROGRAM ELEMENT NO: 2AC129-53
	11 CONTRACT/GRANT NO: 68-02-1094
12 SPONSORING AGENCY NAME AND ADDRESS: U.S. EPA; OAQPS, MDAD, SRAB Research Triangle Park, N. C. 27711	13 TYPE OF REPORT AND PERIOD COVERED: Final
	14 SPONSORING AGENCY CODE
15 SUPPLEMENTARY NOTES	

16 ABSTRACT

A presentation of abstracts of air quality monitoring studies conducted in the vicinity of indirect sources is made. Types of indirect sources include airports, amusement parks, highways, parking lots, shopping centers, recreational areas, sports complexes, commercial and residential developments and parking garages. The purpose of the report is to provide potential sources of information to these agencies or developers having to make an analysis of the impact of a proposed indirect source on air quality.

REPRODUCED BY NATIONAL TECHNICAL INFORMATION SERVICE U.S. DEPARTMENT OF COMMERCE SPRINGFIELD, VA. 22151

17 KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN-ENDED TERMS	c. COSATI Field/Group
Air pollution, atmospheric composition, exhaust emissions, carbon monoxide	Air quality monitoring indirect sources	1302 Civil Engineering air pollution

18 DISTRIBUTION STATEMENT: Release unlimited	19 SECURITY CLASS (This Report): Unclassified	21 NO. OF PAGES: 82
	20 SECURITY CLASS (This page): Unclassified	22 PRICE: $4.00

EPA Form 2220-1 (9-73)

EPA-450/3-74-043

COMPILATION OF INDIRECT SOURCE MONITORING STUDIES

by

John T. MacWaters and Douglas J. Pelton

GEOMET, Inc.
50 Monroe Street
Rockville, Maryland 20850

Contract No. 68-02-1094
Task Order #5
Program Element No. 2AC129-53

EPA Project Officer: Edwin L. Meyer, Jr.

Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

April 1974

This report is issued by the Environmental Protection Agency to report technical data of interest to a limited number of readers. Copies are available free of charge to Federal employees, current contractors and grantees, and nonprofit organizations - as supplies permit - from the Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711; or, for a fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.

This report was furnished to the Environmental Protection Agency by GEOMET Inc., in fulfillment of Contract No. 68-02-1094. The contents of this report are reproduced herein as received from GEOMET Inc. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

Publication No. EPA-450/3-74-043

INTRODUCTION

GEOMET, Incorporated has compiled a set of abstracts from studies related to the influence of indirect sources on air quality. The work has been done in response to Task Order 5 under Contract 68-02-1094. The specifications of that Task Order stated that,

> "The Environmental Protection Agency, in response to a court order, is promulgating regulations requiring the review by State Air Pollution Control Agencies of indirect sources of pollution. . . . As a result of the EPA regulations, states and/or developers may find it necessary to draw upon the results of previous studies and existing expertise to adequately estimate the impact of a proposed indirect source. . . ."

The purpose of the Task Order was to make a compilation of previous monitoring studies to familiarize interested parties with the extent of previous studies. The scope of work statement indicated that the required compilation would be included as an appendix to an EPA prepared guideline document for review of indirect sources. The compilation of abstracts has been provided to the project officer at an earlier date to comply with his timing requirements.

A final version of the abstracts compiled and the necessary introductory material is provided as the main portion of this report, in a form ready for insertion to the guideline document.

Approach and Scope of Work

The approach to the work completed for this task was to gather any information regarding appropriate studies from (1) GEOMET's awareness of

studies underway or completed, (2) from a literature search provided by APTIC or from a telephone canvassing effort.

The abstracts included have been prepared by GEOMET for this report by writing the abstract; (1) after reviewing a report, (2) from information received during the telephone conversations or (3) modifying the abstract provided by the author of the study.

A significant portion of the work effort was expended on the telephone survey. A proportional amount of the relevant studies for this task were found through the telephoning effort. The telephone portion of work worked like a chain letter in that initial telephone calls were made to each of the 10 EPA regional offices. In a typical telephone interview the interviewee was asked to provide any information from studies he was aware of and then asked to furnish names of anyone whom he knew might be able to provide additional information regarding other studies.

The regional offices referenced state air pollution control agencies or state highway departments which they thought would be possible sources. Follow-up calls were made to each state agency which had been specifically mentioned by the regional EPA office or by state agencies from other states. During each telephone call each person was asked to furnish any possible leads to pertinent studies that he was aware of. By following up on each referral the agency or contractor which had performed the monitoring activity was contacted. At that point a request was made for a copy of the report, a copy of an abstract or enough information by telephone to prepare a summary which could be included with this report. Frequently, that was not the end of the work involved to get the necessary information because the contractor often had to have permission from the sponsor to release the information, which required additional calls to request that permission.

The responses to the requests were usually cooperative and in most cases when the sponsor of a study was willing to release the information the contractor (or sponsor) sent copies of the reports or abstracts of the report. That assistance is gratefully acknowledged. It is important

to point out that although most of the requests were met with a cooperative attitude it is known that some significant work which has been conducted is not included in this survey because the release of the information could not be obtained or the work involved what was considered to be privileged information by the interviewee.

In addition to the 10 EPA regional offices, officials in 26 states were called. Contacts made with state officials included calls to the air quality control agencies and frequently to the state's department of transportation. Local air pollution control agencies were called when state level agencies referred to them. Other calls included a selected list of research organizations which were known or suspected to have conducted such studies. Architectural and engineering firms were called only from specific referrals.

In order to keep the effort within reasonable limits, and more importantly to limit the information supplied to the Guidelines Document user to that which would be truly helpful, a large number of the studies or abstracts reviewed were rejected. With very few exceptions, the criterion was that the study had to include air quality measurements related to automotive emissions associated with an indirect source to be included. Various other reasons for omitting studies were:

(1) No traffic or meteorological data

(2) Meager quantities of air quality data especially in older studies

(3) Lack of definitive information in an abstract coupled with an untranslated foreign text (there were perhaps 100 abstracts of Japanese text studies produced by the APTIC search. There may be valuable information included in these studies but the information in the abstract would not justify the effort required for the average Guidelines Document user to have a translation made).

This Appendix provides a set of abstracts from studies which relate to indirect sources. The abstracts have been compiled from a general awareness of studies completed or underway, from a computerized literature search provided by APTIC or from an extensive telephone canvassing effort. The abstracts which are included are intended to help those who will be conducting similar studies in the future by providing a general review of the work that has been done. It is fully realized there are more studies which could be included in this collection but have not been included because the information was not available within the time and effort allocated to this portion of the document preparation.

The format used to report the studies includes the following headings:

(1) Study Title
(2) Sponsoring Agency
(3) Agency/Contractor (If Applicable)
(4) Agency/Contractor (Performing Monitoring)
(5) Report
(6) Abstract

A brief explanation of the information included with each heading will be helpful to understand the flexibility which was used in preparing each report.

Preceding page blank

Study Title: On formal studies or studies for which a report has been written the use of this heading is obvious. For some studies which are in preparation or for some reason a title was not given, a descriptive phrase is used as a title. In the cases where a descriptive phrase is used a series of periods (. . .) is used before and after the phrase.

Sponsoring Agency: The entry here is usually the direct sponsor for the study. In some studies with complex sponsorship the relationships were not clear from the material obtained, and the sponsor listing may not be complete.

Agency/Contractor (If Applicable): The name of the agency or firm responsible for the overall study is included for those cases where a prime contractor subcontracted some or all of the monitoring work. Frequently this information was not appropriate or was not known. In these cases no entry was made.

Agency/Contractor (Performing Monitoring): The name of the firm which actually set up and maintained the monitoring instruments is entered. In those studies where there was only an abstract to work from e.g., from the APTIC literature search, it could not be determined who performed the monitoring.

Report: The entry here is one of the following:

(a) The formal designation of the report
e.g., company and report number

(b) The type of report
e.g., final report to EPA for contract

(c) A publication reference to the report
e.g., publication title, volume and number

(d) NTIS identification number

(e) APTIC abstract number.

For these studies for which information was provided from a telephone conversation there is no entry after this heading.

Abstract: Whenever possible the author's abstract is included with any additional information which was thought necessary. When a suitable abstract was not available an abstract was prepared either from the report, from summaries or other descriptive material supplied, or from information obtained by telephone interview, as appropriate. Whenever it was definitely known that actual traffic counts or on-site meteorological data was collected, that information is so stated.

The abstracts included are grouped by the source type which it related to. The seven indirect sources specifically identified have been arranged alphabetically and are presented in that order. An additional category has been added to include those studies which do not belong in the first seven headings. The order of arrangement is:

1. Airports
2. Amusement Parks
3. Highways
4. Parking Lots
5. Recreational
6. Shopping Centers
7. Sports Complexes
8. General Studies

Some studies included more than one type of indirect source. In these cases, the abstract was included in each of the appropriate categories.

For identification of each category a title and number has been placed on the upper right corner of the first page of each abstract for the user's convenience.

Study Title:	AIR POLLUTION AT HEATHROW AIRPORT, LONDON APRIL-SEPTEMBER 1970
Sponsoring Agency:	
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Warren Spring Laboratory, Department of Trade and Industry, England
Report:	Paper 710324 Presented at SAE/DOT Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971

ABSTRACT

Calculations have been made of total pollution emissions at Heathrow Airport, London, from aircraft operations, heating installations and road traffic. Comparisons were made of concentrations of pollution levels from the airport and from nearby residential areas. Measurements of smoke, sulphur dioxide, oxides of nitrogen, carbon monoxide, total hydrocarbons and deposited matter were also carried out in different parts of the airport.

The results showed that the airport was not contributing unduly to local pollution. At no time did pollution concentrations at the airport ever exceed values which have been found in Central London. The highest values obtained came from road traffic in the Central Area.

Study Title:	MODEL VERIFICATION - AIRCRAFT EMISSIONS IMPACT ON AIR QUALITY
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor (If Applicable):	GEOMET, Incorporated
Agency/Contractor (Performing Monitoring):	GEOMET, Incorporated
Report:	Final Report to E.P.A. for Contract No. 68-02-0665

ABSTRACT

Under EPA contract, GEOMET completed a program of air quality measurement, model development and model validation at Washington National Airport.

The measurement program generated six months of records of air quality data, airport operational data, and meteorological data, some of which were used in the model development and validation, and all of which are recorded in edited, processed form on magnetic tape for future use.

Seven air quality monitoring sites were located on the airport with continuous measurement of carbon monoxide and particulates. At three of the seven sites total hydrocarbons, methane, nitrogen dioxide, ozone and coefficient of haze was also measured continuously. At one station meteorological data was recorded continuously. Meteorological and air quality data were collected during October 1972 through April 1973.

The model development work started from a model developed previously by Northern Research and Engineering Corporation (NREC), which had been previously shown by others to generally underpredict concentrations by a factor of about ten. In this project, the first step was to make a number of improvements in implementing the model, without basically changing the model itself. Briefly, these may be summarized as: the use of different methods (from those used by NREC and others): for calculating single values of short-term concentrations; for calculating maximum values of short-term concentrations; and for calculating long-term average values of concentrations. For the first of these three, the change involved the dropping of a superimposed wind direction variability parameter, substituting a single direction only. The next two were handled jointly by calculating long-term average concentrations from a sufficiently large sample of single short term values, rather than the NREC use of the joint frequency distribution of meteorological conditions. This also provides better estimates of maxima than, as NREC does, calculating presumed maxima based on the selection of the meteorological condition judged to cause the highest concentrations. The NREC model with this improved implementation was applied to make estimates of the non-reactive pollutants (carbon

monoxide and particulates). This model still consistently underpredicted; however, now the combined estimated station median and mean values were low by factors ranging from 1.5 to 4, rather than the rpeviously stated factor of 10.

Further more significant modifications were then made to the model, in the form of an improved aircraft classification system, improved aircraft operational modes and pollution emission rates, increased and improved details of airport representation, improved environ area source modeling and emission rates, more representative depiction of line sources, and inclusion of major peripheral highways. This is called the modified (GEOMET) model.

The final result of much validation analysis showed the modified (GEOMET) model as consistently predicting near the mean and median values for CO and particulates (ranging from 16 percent underprediction to 36 percent overprediction); an occasional tendency to overpredict by as much as a factor of two for some of the higher percentile values is explained and can be accounted for in model use.

Study Title:	ANALYSIS OF AIRPORT AIR QUALITY MONITORING DATA
Sponsoring Agency:	Federal Aviation Administration
Agency/Contractor (If Applicable):	Northern Research and Engineering Corporation
Agency/Contractor (Performing Monitoring):	Environmental Research and Technology, Inc.
Report:	Paper 73-156 given at 66th Annual Meeting of the Air Pollution Control Association, Chicago, Illinois, June 24-28, 1973

ABSTRACT

The body of information presented in this paper is directed to persons who are concerned with the general level of air quality at airports and who are also concerned with understanding the relationship between airport ground operations and the resultant time and spatial variations in air pollution concentrations within the airport boundaries. The paper describes the results of an air quality measurements program conducted at a major urban airport (Washington National Airport). Five pollutants (CO, NO_x, HC, TSP, and SO_2) were monitored continuously at three sites for a 3-month winter period (December 1971 through March 1972), and for a 1-month summer period (August 1972). In addition, CO was monitored at a fourth site throughout each sample period.

A detailed analysis of the CO data describes compliance with ambient air quality standards, diurnal variations in average hourly observations, and correlations between meteorological conditions and observed worst case CO levels. In addition, pollution roses for the CO data are analyzed to determine correlations among air quality, meteorological conditions, and emission source strength.

Results of the study indicate that CO violates ambient standards, and that the highest observed concentrations occur in the immediate vicinity of the terminal gate areas. The analysis of the pollution roses indicates that: (1) significant variations in CO concentration levels occur within short distances within the airport boundaries; (2) building structures and heavily traveled roadways represent significant influences on the observed spatial air quality patterns; and (3) high CO concentrations over the sampling period are due primarily to high source emissions rather than to adverse meteorological conditions.

Study Title:	SEA-TAC/COMMUNITIES PLAN
Sponsoring Agency:	Port of Seattle and King County, Washington
Agency/Contractor (If Applicable):	Environmental Systems Laboratories, Inc.
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratories, Inc.
Report:	Six-Month Summary Report of Progress

ABSTRACT

Background - Increased levels of air traffic intensity coupled with increased residential development in nearby communities has created land use problems in some areas of those communities. A Sea-Tac International Airport and Vicinity Master Plan Project has been initiated to resolve the incompatibility of the airport use and community development.

The Port of Seattle and King County are jointly sponsoring the study. Two-thirds of the study cost is financed through an Airport Master Planning Grant from the Federal Aviation Administration (FAA). The study project was initiated in March 1973, and reports of progress are issued at six-month intervals.

Environmental studies is one of the five major efforts of the study project. The environmental studies include: (1) noise exposure, (2) air quality, (3) water quality/drainage, (4) solid waste, (5) natural determinants, (6) aesthetic and visual characteristics, and (7) community attitudes.

Air quality measurements were made at two sites in close proximity of the airport. At each site vans with equipment to measure concentrations of (1) carbon monoxide, (2) hydrocarbons, (3) nitrogen oxides, (4) particulates, (5) oxidants were set up and operated during June and September 1973 by Environmental Systems Laboratories, Inc. of Sunnyvale, California. Predictions of future air quality levels were computed using a computer model. The data collection was to include nine weeks of air quality monitoring. Comparison of the existing and forecast levels of those pollutants to the Federal primary air quality standards indicated the standards would not be exceeded in the 1973-1993 time period.

A study of surface transportation is included as part of the overall study but traffic data were not available in the documents reviewed. Air quality data for the Sea-Tac Communities Plan were reported by Environmental Systems Laboratory in two reports: 1. Sea-Tac Air Quality-Preliminary, Sunnyvale, California, October 12, 1973 and 2. Addendum, Sea-Tac Air Quality-Preliminary, Sunnyvale, California, October 12.

Study Title:	BOSTON-LOGAN INTERNATIONAL AIRPORT PRELIMINARY ENVIRONMENTAL IMPACT REPORT FOR A PROJECT TO EXTEND RUNWAYS 4L AND 9 AND CONSTRUCT STOL/GA RUNWAY 15-33
Sponsoring Agency:	Massachusetts Port Authority
Agency/Contractor (If Applicable):	Landrum & Brown, Inc.
Agency/Contractor (Performing Monitoring):	Booz, Allen & Hamilton, Inc., Environmental Resources Group
Report:	Appendix E. Environmental Impact Statement for Extension of Runways 4L and 9 and Construction of STOL/GA Runway 15-33 at Logan International Airport

ABSTRACT

Air quality data for Logan International Airport were compiled by Booz, Allen & Hamilton, Environmental Resources Group and reported in a Draft Environmental Impact Statement required for proposed construction work which would extend runways 4L and 9 and construct STOL/GA runway 15-33. The report is dated July 1973 and was available for review from E.P.A. Region I office in Boston. Appendix E of that report provides the air quality data pertinent to the proposed airport changes.

Air quality measurements were made for three one-week periods in the winter of 1972. Measurements of sulfur dioxide, nitrogen dioxide, coefficient of haze, carbon monoxide and hydrocarbons were made at various locations both on and off the airport. Not all pollutants were measured at each site. The air quality data collected were combined with air quality data collected in the spring of 1971 and were thus considered to be an adequate sample to represent the airport and environs.

Continuous (24 hour) particulate sampling was carried out at six selected sites on the airport property. Samples for the gaseous pollutants were collected at the downwind end of the most active runway two to four times a day during the sampling periods.

Analysis of the data collected indicates the ambient air at the airport is generally of better quality than the air in the urban area of Boston. Calculations were made which show the aircraft operations cause less than one-half of one percent of the formation of the five principle air pollutants generated in the Metropolitan Boston area. Projections of aircraft emissions for 1980 were made in order to compare the possible alternatives to the airport plan and the impact on air quality which would result from those alternatives.

Study Title:	AIRPORTS AS TRACE METAL SOURCES: A STUDY OF FRIENDSHIP INTERNATIONAL AND WASHINGTON NATIONAL AIRPORTS
Sponsoring Agency:	U.S. Atomic Energy Commission Contract Number AT-(40-1)-4028 and National Science Foundation RANN Program Grant No. GI 36338X
Agency/Contractor (If Applicable):	University of Maryland
Agency/Contractor (Performing Monitoring):	University of Maryland
Report:	Master's Thesis - Tomas J. Conry

ABSTRACT

Samples of atmospheric particulate material were collected using filters at Baltimore's Friendship International, and Washington's National Airports. These samples were analyzed by instrumental neutron activation analysis for about 20 trace elements to determine if trace metals are emitted in significant quantities by airports. A few samples were collected using a cascade impactor to determine the size distribution of the observed atmospheric trace elements. Samples were collected during the winter of 1972-73.

The emissions were usually characteristic of vehicular activity and other sources around the airports rather than aircraft. Some elements that showed downwind enrichments did correlate with aircraft and service vehicle activity: Na, Ba, V, Mn, Zn, As, Se, Sb. Correlation with wind direction indicates that small amounts of V, Mn, Zn, As, and Se are coming from aircraft activity.

Study Title:	STUDY OF JET AIRCRAFT EMISSIONS AND AIR QUALITY IN THE VICINITY OF THE LOS ANGELES INTERNATIONAL AIRPORT
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor (If Applicable):	Los Angeles County Air Pollution Control District
Agency/Contractor (Performing Monitoring):	Los Angeles County Air Pollution Control District
Report:	NTIS No. PB 198 699

ABSTRACT

A study was conducted at Los Angeles International Airport (LAX) in 1968 to obtain the most complete and comprehensive information possible on the kinds and quantities of air contaminants emitted by jet aircraft. A later study was made at LAX during the period June 30, 1969 through November 18, 1970. Specific objectives of this study were to determine:

- Total pollutant emissions from aircraft and ground operations.
- Measurement of exhaust emissions from Pratt & Whitney JT4A and JT8D engines to complete the emission data previously obtained by APCD for other contemporary gas turbine aircraft engines.
- Atmospheric concentrations of CO and particulate matter at ground level within and around the airport.
- Measurement of CO exposure within aircraft cabins during all ground operations.

Measurements of ambient concentrations of CO and suspended particulates were made at fixed and mobile sites outside airport locations, inside airport terminals, and in residential and commercial areas on a 2-mile radius of the airport.

Background concentrations were continuously measured at two sites. Mobile monitoring stations were set up at 41 different locations where they were operated each weekday and on six weekend days for a continuous 6-hour period.

Estimates were developed for a large variety of ground operations routinely carried on in support of aircraft operations. Special tests were made to measure CO concentrations inside an aircraft cabin during the period when passengers are loaded through the time when the aircraft

idled on the runway prior to take-off. Conclusions as to the extent of impact aircraft operations have on air quality are given as well as data for the derived emission estimates and a summary of data from the air quality monitoring stations. Some major conclusions from this study are summarized below:

Aircraft and Ground Operations

Jet flights account for 53 percent of the total atmospheric pollution burden generated within the boundary of Los Angeles International Airport (LAX). About 90 percent of the particulate matter and 72 percent of the hydrocarbons in this total originate from jet sources.

Ground operations account for 42 percent of total air contaminant emissions and 55 percent of total CO emissions at LAX.

LAX is a significant area source of air contaminants, generally upwind of metropolitan Los Angeles.

The 6.7 tons of particulate matter emitted daily in the 4.7 sq mi LAX source area exceeds the atmospheric loading rate of particulates from any area of comparable size in Los Angeles County.

About 70 percent of total jet aircraft operation time to and from 3500 ft altitude, is spent in the idle and taxi mode, which accounts for about 55 percent of total aircraft emissions.

Particulate emissions from jet aircraft engines are very conspicuous during both final approach and take-off. However, about 40 percent of particulate matter emitted from jet flights occurs during taxi and idle modes after arrival touchdown and before initiating the take-off run.

The JT8D engine emits total air contaminants at a rate about twice that of any of the other six models tested.

Atmospheric Measurements

One result of airport activities is an increased soiling effect. Atmospheric contamination measurements of particulates by Km show significantly higher values in the airport area than at a location several miles removed, such as Downtown Los Angeles, although total weight of particulate material, Hi-Vol, varies little between the areas.

Monthly average CO values at Downtown Los Angeles (4-6 ppm) and Lennox (6-7 ppm) are within the range of ambient concentrations measured at the airport stations (2-18 ppm).

CO levels at paired inside-outside sampling locations, with one exception, are higher at the inside station. Statistical analysis indicates that higher internal readings are caused by undetermined emission sources.

The emission inventory indicated that auto traffic is an appreciable contributor to the observed contaminant levels and should be considered in any appraisal of the impact of an airport on the surrounding community.

Aircraft Cabin Air Sampling

During runway operations, carbon monoxide concentrations in aircraft cabins ranged from 2 to 7 ppm and usually averaged 4 ppm. These values are compared to airport background values and significantly lower than levels to which the air traveler is exposed during his stay at the air terminal prior to taxiing onto the runway.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 2 - AIRPORTS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	AIRPORT VICINITY AIR POLLUTION STUDY AT O'HARE INTERNATIONAL AIRPORT, CHICAGO, ILLINOIS AND ORANGE COUNTY (CALIFORNIA) AIRPORT
Sponsoring Agency:	Federal Aviation Administration
Agency/Contractor (If Applicable):	Argonne National Laboratory
Agency/Contractor (Performing Monitoring):	Argonne National Laboratory
Report:	Final Report to F.A.A. for Interagency Agreement No. DOT-FA-71 WAI-223

ABSTRACT

The report contains a complete description of the results obtained during the Airport Vicinity Air Pollution Study performed by the Argonne National Laboratory, Energy and Environmental Systems Division* for the Federal Aviation Administration under Interagency Agreement DOT-FA-71WI-223. Additional support for portions of this program was provided by the Illinois Institute for Environmental Quality.

The primary objective of the program was the development of a computer model that could be used to determine the impact of an existing or planned airport on the air quality in its vicinity.

The model development was supported by an air quality monitoring and emission activity data acquisition program. O'Hare International Airport (the busiest commercial airport in the world), which is located near Chicago, Illinois, and Orange County Airport (a busy general aviation facility), which is 40 miles south of Los Angeles, California, were selected as test sites for the program.

The activity simulation and air quality model developed during this program are discussed in detail in the text. Results of computations of air quality concentrations and comparisons with observations are presented and discussed. The results of the data acquisition program are given in the appendices.

The casual reader will find the introduction and summary sections of greatest interest. Section 3, which provides a detailed description of the air quality model and aircraft activity simulation should be of more interest to the modeling audience. The potential computer program user will find the latter portions of Section 3, which describe the computational package, of use. Those readers who are concerned primarily with

* Formerly Center for Environmental Studies

airport activity, emissions, and air quality data will want to refer to the appropriate appendices.

Air quality measurements for particulates, coefficient of haze, hydrocarbons, nitric oxide and other oxides of nitrogen were made at various locations at both airports using stationary and mobile samplers.

A number of airborne monitoring flights were made in the O'Hare Airport and Orange County Airport vicinity to determine if pollutant concentration gradients existed within or near the airport and the flight paths of approaching or departing aircraft. Results of these studies will be available when the final report is published in the near future.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 5 - AMUSEMENT PARKS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	AIR QUALITY ASPECTS OF THE I-66 CORRIDOR TRANSPORTATION ALTERNATES STUDY
Sponsoring Agency:	Virginia State Department of Highways
Agency/Contractor (If Applicable):	Howard, Needles, Tammen and Bergendoff Alexandria, Virginia
Agency/Contractor (Performing Monitoring):	Battelle Memorial Laboratories Columbus, Ohio
Report:	Air Quality Aspects of the I-66 Corridor Transportation Alternates Study

ABSTRACT

As indicated by the title the program is designed to evaluate several transportation alternatives in the vicinity of Washington, D. C. and the Northern Virginia area of Arlington and Fairfax counties. Air quality measurements were made at three locations along the proposed interstate corridor for approximately 10 days at each site during July and August 1972. Air quality measurements included: suspended particulates, lead, total hydrocarbons, methane, oxidants, and carbon monoxide. Wind speed and direction measurements were made at the monitoring trailer, other meteorological data was obtained from the hourly observations made at Washington National Airport. Emissions estimates were generated for grid areas in the study area and air quality estimates were made for various future time periods using different transportation alternatives. Traffic data included data from traffic counts and a home interview survey conducted in 1968. Results of the study indicate:

1) No matter which alternative is selected the air quality should improve.
2) Air quality standards will occasionally be exceeded within 300 feet of the more heavily traveled portions of I-66 or U.S. 50.
3) Of six alternatives considered the highway option is predicted to produce the maximum air pollutants emissions but each strategy considered there were locations where the air quality would be poorer than from the highway option.
4) Hydrocarbons and oxidants do exceed air quality standards however carbon monoxide is not likely to exceed standards even in the heavy traffic area of Key Bridge in the winter time.

5) Lead concentrations would exceed 2 $\mu g/m^3$ if the highway option is used and lead content of gasoline is not reduced.

Study Title: A Carbon Monoxide Profile of a Main Artery in Mexico City

Sponsoring Agency:

Agency/Contractor (If Applicable):

Agency Contractor (Performing Monitoring):

Report: APTIC Abstract 27408

A Carbon Monoxide Profile of a Main Artery in Mexico City. Preprint Air Pollution Control Assoc., Pittsburgh, Pa., 16P., 1970. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-13.)

ABSTRACT

Unusually favorable conditions for the production and retention of atmospheric pollution in Mexico City include many factories with uncontrolled smoke emissions, large numbers of old, poorly tuned automobiles using low-grade, high-sulfur content fuels, many diesel motors, wide-spread trash burning, and fuel oil use for heating. Also, the city is surrounded by mountains and the natural air flow is minimum, while the altitude of 7100 feet and a large percentage of sunny days contribute to the importance of photochemical smog. Preliminary carbon monoxide concentrations sampled in November 1969 along the Paseo De La Reforma showed levels of about 45 PPM in areas where this street is about 150 feet wide. In the downtown area this street narrows to only three lanes and is about 40 feet wide, lined with 5-story buildings. Here, 100 PPM of CO was recorded, and a high of 190 PPM at the entrance of a parking garage. Traffic density was moderate at the time.

Preceding page blank

Study Title:	INDOOR-OUTDOOR CARBON MONOXIDE POLLUTION STUDY
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor (If Applicable):	General Electric Company
Agency/Contractor (Performing Monitoring):	General Electric Company
Report:	Final Report to EPA under Contract No. EPA 70-77

ABSTRACT

The high value of land in some urban areas has caused some developers to build "air rights" buildings which occupy the space above highways. The object of this study was to assess the potential danger to the health of persons inhabiting the building from the pollutants generated by vehicular traffic on the highway. The study design was to obtain a large statistical data base of carbon monoxide, hydrocarbons, particulates and lead concentration inside and outside each building at different levels above the roadways and to relate those concentrations to the wind, temperature and traffic conditions. Two buildings were studied, one an "air rights" apartment building and the other a more conventional high rise apartment building in a canyon like street in midtown Manhattan. Measurements included simultaneous continuous monitoring of air pollutants, meteorological variables and traffic flow rate and velocity at each building for 5 months.

Extensive conclusions are made regarding the relationship of traffic generated pollutants to horizontal and vertical distribution both indoors and outdoors and the variability of concentrations with meteorological parameters. Among the many conclusions it is noted that carbon monoxide concentrations at both sites were traffic generated. Hydrocarbon concentrations at the air rights building were attributed to both traffic and cooking facilities, while at the conventional building painting work emissions masked any traffic related hydrocarbons. Particulate concentrations were not related to traffic at either building. Lead concentrations at the air rights building were probably due to traffic but lead concentrations at the conventional building were controlled by painting operations.

Study Title: ANALYSIS OF EXHAUST GAS INVESTIGATIONS IN PARIS

Sponsoring Agency:

Agency/Contractor
(If Applicable)

Agency/Contractor
(Performing Monitoring)

Report: APTIC Abstract 08568
Carbon Monoxide: Analysis of Exhaust Gas Investigations in Paris. Environ. Res., 1(2):198-2168 Oct. 1967. 3 Refs.

APTIC ABSTRACT

Using a motor car sampler, ambient air samples from Parisian streets were taken at 317 locations. The content of CO in unventilated tunnels as well as streets was measured with infrared analyzers. Yearly maps of vehicular pollution (CO levels) were drawn: differences in maps from 1959 through 1966 were found to be insignificant. In tunnels, there was a good correlation between tunnel length and CO level. A 24-hr. curve of street CO level shows CO level and traffic intensity to be directly correlated. A close correlation is found between average CO level (for 10 hrs.) and average lead content in the air, suggesting the two pollutants have the same origin. There is no correlation between CO and benzo(A)pryene levels. Automobile exhausts are responsible only for 10-20 percent of benzo(A)pyrene air pollution. A technique for reducing the CO content of exhaust gases during idling by means of a carburetor adjustment is mentioned. It is used on all police cars, with a resultant reduction of CO levels (from 97-150 ppm. to 24-38ppm.) in the police garage. In the blood of traffic policemen, tested before and after duty, carboxyhemoglobin (COHB) levels increased in nonsmokers, but may decrease in smokers, due to high levels achieved before duty. Cab drivers, when driving in traffic, tend to have higher COHB levels than workers exposed to CO, traffic policemen, or private individuals with suspected accidental CO exposure. Underground parking garages can have astonishingly high levels of CO: a new one in Paris was found to have levels above 200 ppm. for as long as 20 min. and average CO levels often reached 90-100 ppm. The adoption of air quality standards for garages is now in force in Paris.

Study Title:	AIR QUALITY ANALYSIS FOR THE MOUNT HOOD FREEWAY - I-80N IN PORTLAND, OREGON
Sponsoring Agency:	Oregon State Highway Division and U.S. DOT Federal Highway Administration
Agency/Contractor (If Applicable):	Skidmore, Owings, & Merrill
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory
Report:	I-80N Environmental Study - Air Quality Analysis Technical Supplement

ABSTRACT

Dispersal model validation and ambient air quality measurements were executed over a 4-month period as a basis for prediction of future air quality changes due to the construction of a 5.5-mile-long, 10-lane section of Interstate 80N.

The field experiment was conducted at an urban site in Southeast Portland, Oregon. A mobile air quality laboratory and data collection system was operated at three different locations selected to characterize dispersal for the roadway geometries planned, varying from deep cut to at grade, and to typify 24-hour air quality variation. Pollutants measured included CO, NO_x, total particulate lead and reactive hydrocarbons.

Validation measurements were taken in complete data sets for all pollutants for a variety of meteorological and traffic conditions at each site, utilizing an array of up to seven monitoring locations including one upwind to characterize dispersal. CO was collected using automatic elevated bag samplers at all locations, and analyzed using gas chromatography in the van. NO_x was recorded using a movable teflon tube sample line directly connected to a wet-chemical analyzer, and particulate including lead was collected on filter paper using high volume samplers. Filters were weighted, and analyzed for elements heavier than aluminum using x-ray flourescence analysis. Wind speed, direction, and horizontal sigma were recorded. All data sets were collected in conjunction with simultaneous ambient pollutant monitoring bidirectional traffic speed and volume, vehicle mix, temperature, cloud cover and precipitation information being recorded.

Ambient background concentrations or all pollutants were collected continuously 24 hours a day along with meteorological data at the validation sites. In addition, automatically timed remote samplers at 10 locations simultaneously throughout the roadway corridor collected CO over periods of up to 2 hours in bags, at pre-set intervals through the day. These were collected and analyzed at the mobile laboratory.

All data was normalized, calibrated, and reduced by computer. Outputs included hourly, 8- and 24-hour averages, and a graphical presentation of varying pollutant levels and meteorological parameters.

Study Title:	AIR QUALITY IMPACT STUDY FOR PROPOSED HIGHWAY WIDENING NEAR OJAI
Sponsoring Agency:	California DOT (District 7)
Agency/Contractor (If Applicable:	
Agency/Contractor (Performing Monitoring):	Stanford Research Institute
Report:	To be prepared in summer of 1974

ABSTRACT

Stanford Research Institute is undertaking a research project to analyze the potential effects on air quality that might be associated with a proposed highway widening and realignment in the Ojai area of Ventura County - specifically Routes 33 and 150 from the end of Route 33 Freeway at Casitas Springs Road to Maricopa Road in the City of Ojai. This research project is funded by the California Department of Transportation, District 7.

The objectives of this study are as follows:

1. Measure and characterize the current air quality and meteorology in the Ojai area.
2. Predict future air quality near the roadway and area-wide, with and without the highway improvement, for the years 1980 and 2000.
3. Assess the effects of current air quality on local agriculture by means of site surveys, and predict future effects with and without the proposed highway improvement for the years 1980 and 2000.

Air quality measurements will include nitric oxide, nitrogen dioxide, nitrogen oxides, ozone, carbon monoxide, methane, total hydrocarbons suspended particulates, lead, and atmospheric turbidity.

The measurement program will consist of three phases. Two area-wide measurement phases will be conducted - the first during the smog season when visibility reduction occurs, and the second during late fall when pollutants are present but visible smog is not evident. The third measurement phase will determine pollutant concentrations near the roadway area where the proposed improvement would occur.

During the area-wide measurement phases, a total of six sites will be located throughout the Ojai Valley to measure winds and to monitor

pollutant levels by means of either collected air samples or continuous measurements. Air samples will be collected at five outlying stations and returned for measurement of pollutant levels to a central air monitoring station to be established near Ojai. An instrumented light aircraft will also be used on selected days to obtain measurements at upper levels. Winds at these levels will be obtained regularly by means of small weather balloons.

Once the measurement program has been completed, the data will be analyzed and assembled with other available data on current air quality, meteorology, stationary source pollutant emissions, and traffic patterns and volumes for the region. Using this data base, current air quality in and around the Ojai area will be simulated numerically using a computer. Predictions of future air quality will be made by using traffic projections for the years 1990 and 2000 as inputs to the computer simulation model. In addition, the influence of alternative forms of transportation such as bus or rail transit systems on air quality will be modeled. Estimates will also be made of the effects of predicted future air quality on local agriculture.

Study Title: A STATEMENT ON THE EXPECTED IMPACT OF INDIRECT SOURCES ON AMBIENT AIR QUALITY

Sponsoring Agency: Texas Air Control Board

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring): Texas Air Control Board

Report:

ABSTRACT

The Texas Air Control Board has conducted a series of studies of carbon monoxide concentrations near highways, roads and major intersections in Fort Worth and Dallas, Houston, San Antonio, and the Houston Ship Channel area. In Fort Worth and Dallas, 55 sampling sites were selected at major intersections and carbon monoxide was measured for five minutes at each site. Traffic count data are available from some sites and estimates of traffic are made where actual counts were not made. Five minute average CO values in Fort Worth ranged from 1.5 to 8.0 ppm. In Dallas the CO values ranged from 3.5 to 16.0 ppm. Data from studies in San Antonio, Houston and the Houston Ship Channel are given. The data from those studies support the findings in Dallas-Fort Worth that low concentrations of CO are found throughout those cities. CO measurements in Houston were made from a roving van with the results showing 90 percent of the observations made, which included measurements on high traffic volume freeways and interchanges which have traffic volumes as high as 202,000 vehicles per day, were below 10 ppm.

It is anticipated, by the Texas Air Control Board that the findings of the highways and intersections studies can be applied to other indirect sources. The conclusions made in this paper were:

1. CO levels are uniform across urban areas and are well below the national ambient air quality standard.
2. No significant consistent correlation can be made between traffic count on the highways and intersections and measured CO concentrations.
3. Ambient CO levels are not significantly influenced by traffic on highways beyond a short horizontal distance from the highway due to the rapid dispersion of the pollutant.

Study Title:	AN AIR QUALITY ASSESSMENT FOR 148th STREET, BELLEVUE, WASHINGTON
Sponsoring Agency:	
Agency/Contractor (If Applicable):	CH_2M Hill and Associates
Agency/Contractor (Performing Monitoring):	Northwest Environmental Technology Laboratories, Inc.
Report:	NETL No. 38-73-038

ABSTRACT

The study conducted was to provide an assessment of the impact of increasing traffic capacity on the air quality in the vicinity of 148th Street in Bellevue. The air quality assessment required evaluation of pollutant contributions from several sources, e.g., background levels from homes, businesses, and vehicles on local streets. Additional contributions from vehicles using parking lots at two shopping centers are considered separately. Carbon monoxide concentrations and meteorological data were collected over a 16-day period in December 1973. Continuous air quality measurements were made at two locations for eight days at each site.

Results of the CO monitoring showed that under constant meteorological conditions the CO concentrations built up as a result of the morning traffic peak tended to persist throughout the day and only a slight additional increase in the evening due to the peak evening traffic. There was little difference between the 1-hour maximum concentrations and 8-hour average concentrations. Air quality standards were not exceeded during the monitoring period.

Traffic data is taken from projected road design capacity. Computer modelling is used to estimate air quality conditions through the year 1990.

Study Title: I-205 AIR MONITORING DATA SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT

Sponsoring Agency: State of Oregon, Department of Transportation, Highway Division

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring): Environmental Section, Highway Division, Oregon Department of Transportation

ABSTRACT

The assessment of the impact of the proposed I-205 Freeway on air quality has been studied in a three part program. The three parts of the program are: (1) Prediction of future air quality, (2) Measurement of existing air quality - long term, and (3) Measurement of air quality - short term (bag sampling). Part I has been completed and reported. Part II is an ongoing program for continuous long-term monitoring of transportation-related pollutants. This part of the program includes a mobile air monitoring trailer which is parked at a site near the I-205 corridor and operated for a three-week period once every three months for a full year.

The monitoring program will obtain information on carbon monoxide, nitric oxide, nitrogen dioxide, ozone, total hydrocarbons, reactive hydrocarbons, methane, suspended particulates and lead particulates. Meteorological parameters will be recorded also. Data will be recorded continuously on a 24-hour basis and stored on a magnetic tape.

Part III of the program has been completed and reported. Part III included a short-term simultaneous bag sampling program designed to determine the instantaneous carbon monoxide background levels over large areas of a freeway corridor. Two meteorological stations were set up to supplement the data collected for the immediate areas of concern.

Information for this summary was taken from the report made for the third part of the program. Results of the whole measuring program are not furnished. Data summaries for Part III are presented which indicate uniform results were obtained from the wide area sampled when care was taken in selecting the sample sites.

Study Title:	ROSTOV-ON-DON ATMOSPHERIC AIR POLLUTION WITH AUTO-TRAFFIC EXHAUST CARBON MONOXIDE
Sponsoring Agency:	USSR
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	
Report:	CFSTI: 63-11570 (Document temporarily out of stock - Abstract below is APTIC Abstract 21076)

ABSTRACT

Air pollution from automobile exhaust gases was studied at four main highways at five observation points located where automobile traffic was heavy. Air samples were collected through the months of April-September during the hours from 8 a.m. - 9 p.m. and through the months of October-November during the hours of 8 a.m. - 5 p.m. Samples were collected into liter flasks by the salt solution-negative-pressure method for 1-2 minutes at 1.5 m above the ground. Three samples were collected at each point: one on the highway itself, one on the sidewalk, and one near trees or bushes. With the aid of a gas analyzer, 1280 samples were analyzed. The results clearly indicated that the city air basin was heavily polluted with carbon monoxide and concentrations ranged between 1.5-80.0 mg/cu m. Approximately 87.7 percent of the samples exceeded the maximum allowable concentration. Generally, the CO concentration varied proportionately with the number of passing automobiles and also with the terrain and meteorological conditions. Carbon monoxide concentrations were higher in the summer and varied very little between the highway, sidewalk, and trees. Samples collected at the wider highways contained lower CO concentrations than did samples collected at narrower highways, probably due to more intensive air circulation and ventilation.

Study Title:	AIR QUALITY ANALYSIS OF ALTERNATIVE HIGHWAY OPTIONS IN THE CLOVERDALE AND HOPLAND AREA
Sponsoring Agency:	California Department of Highways, District 4
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory
Report:	ESL-ET48, June 1973

ABSTRACT

This air quality and meteorology study for the Highway 101 bypass around Cloverdale was sponsored by the California Department of Highways District 4. A validation experiment using automatic collection of air samples at a height of 1-1/2 meters at distances of 8, 16, 32, 64, 128 meters on both sides of an open roadway as well as different locations in downtown Cloverdale was a major part of this effort. Various meteorological and traffic conditions were examined including calm conditions and winds parallel to the roadway. Experiments included validation and reliability measurements. Approximately 1000 air bags were collected in order to validate a dispersal model from the roadway in the urban community and flat terrain. Ambient concentrations of carbon monoxide, lead, oxidants, and nitrogen dioxide were measured for several months.

The influence of valley drainage was found to effect pollution dispersal. The influence of drainage was measured by correlating the wind direction at stations near the bottom of the valley walls to concentrations of CO in the center of Cloverdale. The extreme stagnation from drainage flows at the bottom of the valley results in accumulation of CO from vehicles in the atmosphere.

The results of measurements near the roadway and ambient stations were used to describe the community exposure to degraded air under build and no build strategies. This evaluation will be a part of the Department of Highway's Environmental Impact Statement regarding the proposed construction.

Study Title:	AIR QUALITY ANALYSIS FOR THE I-505 CORRIDOR PORTLAND, OREGON
Sponsoring Agency:	Oregon State Highway Division/Federal Highway Administration
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory, Inc.
Report:	ESL-ET44, September 1973

ABSTRACT

Validation measurements to calibrate air pollution dispersal models for elevated, hillslope, and at grade roadway geometries were conducted along with ambient air quality monitoring in the corridor area for the planned I-505 freeway in Northwest Portland, Oregon. Measurements for CO, NO_x, total particulate and particulate lead were made over a period of approximately 3 months.

Measurements of pollutant dispersion was accomplished at three sites utilizing the ESL Mobile Air Quality Laboratory. An array of up to seven sensing locations extending to 1000 feet from the roadway was used to collect profile data for all pollutants. Analysis of samples was by gas chromatography, liquid chemical analyzer for NO_x, and by atomic excited X-ray flourescence. Wind speed, direction, and horizontal sigma were measured with a sensitive propeller anemometer vane. For data sets, traffic speed, direction and vehicle mix in both directions, temperature, cloud cover, and precipitation information were recorded.

Continuous 24-hour ambient background pollutant concentrations were collected along with meteorological data. Ten automatic timed samplers simultaneously collected bags of ambient air for CO measurement at various locations spaced through the corridor, at pre-set intervals through the day.

This study was the basis for a Draft Environmental Impact Statement.

Graphical presentation of air quality data, meteorological data and comparisons of dispersal model predictions with experimental data are presented.

Study Title:	AIR POLLUTION IMPACT OF PROPOSED WIDENING OF THE NEW JERSEY TURNPIKE BETWEEN EXITS NINE AND TEN
Sponsoring Agency:	New Jersey Department of Transportation
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET32 March 1972

ABSTRACT

Air and noise pollution impact to the predominantly residential community of East Brunswick, New Jersey, was analyzed for widening and no widening alternatives of this major highway. Predictions were made using expected traffic volumes and vehicle emissions for the year 1990. Air pollution measurements of nitrogen oxides with meteorological measurements and traffic counts were made in order to determine the present air quality and study the manner in which air pollutants disperse near the highway. As a result a mathematical model describing the dispersal of vehicle emissions into neighboring land was verified; this model was used to predict future community air quality for oxides of nitrogen, carbon monoxide and hydrocarbons.

Study Title:	WEST SIDE HIGHWAY PROJECT (INTERSTATE ROUTE CONNECTION 518, WEST SIDE HIGHWAY FROM THE BATTERY TO 52nd STREET)
Sponsoring Agency:	New York State Department of Transportation
Agency/Contractor (If Applicable):	Parson, Brinkerhoff, Quade and Douglas New York City
Agency/Contractor (Performing Monitoring):	General Electric Company, Reentry and Environmental Systems Division, Philadelphia
Report:	(A draft EIS is expected by June 1974)

ABSTRACT

The technical air quality study is reported to be patterned on a previous study "Study of Air Pollution Aspects of Various Roadway Configurations", General Electric, September 1973 (NTIS No. PB-211-235). Pollutants measured were carbon monoxide, nitrogen oxides, total hydrocarbons and methane, particulates, and particulate lead. There were four primary measurement sites on the highway and 15 secondary sites in the region which would be most affected by the West Side Highway Project. Meteorological measurements consisted of a continuous recording of wind speed and direction and air temperature. Traffic measurements included volume and speed on each lane of the highway made. A draft environmental impact statement is expected to be published by June 1974.

Study Title:	ENVIRONMENTAL IMPACT OF THE PROPOSED I-287 IN BERGEN AND PASSAIC COUNTIES
Sponsoring Agency:	Local Municipalities in Bergen and Passaic Counties, New Jersey
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET 42, February 1973

ABSTRACT

The study was sponsored by the various municipalities influenced by the corridor decision of Interstate 287. The study involved measurements of ambient air pollution levels as well as the pollution dispersal characteristics of highways. Pollutants measured were carbon monoxide and nitrogen oxides. Meteorological and traffic measurements were also made. The relative exposure to the community of degraded air was evaluated for several alternate corridor decisions and for alternatives generated by the study. In addition to the air quality considerations, community noise exposure and ecological impacts were examined in detail for each alternative.

Study Title:	AIR QUALITY ANALYSIS OF THE WIDENING OF I-80 IN THE VICINITY OF CARQUINEZ, CALIFORNIA
Sponsoring Agency:	California Department of Highways
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET74 (to be published in 1974)

ABSTRACT

In a program for the California Department of Highways, ESL carried out a program to validate both highway and area source dispersal models. Four sites near different characteristics of Interstate 80 north of Berkeley, California were chosen for the highway validation. Air quality at these sites were monitored at several distances from the roadway simultaneously; concurrent traffic counts and meteorology were measured. Pollutants measured were carbon monoxide, total and non-methane hydrocarbons, particulates, nitrogen oxides, and oxidants.

Four ambient CO monitoring sites at the perimeter of the study area were also monitored. This information was supplemented by extensive bag sampling for CO throughout the area.

The information gained during this study was input to a least squares validation of the ESL vertical strip model and the Gifford-Hanna area source model supplementing and extending previous ESL Model validation in Oregon, California, New Jersey and New York. Predictions based on these models were also incorporated as the air quality impact study for the environmental impact statement.

Of particular importance in this study was the meteorological monitoring. The meteorological field experiments measured thermal gradients, wind shear, and turbulence variation with height as input to the subsequent analysis of the relationship between these gradients and the meteorological variables of air temperature, relative humidity, solar radiation and cloud cover. The instrumentation used consisted of arrays of UVW anemometers distributed at various heights and locations and thermocouple arrays as well as the instrumentation for measuring solar radiation. For this program ESL developed a special data acquisition unit which permitted sampling intervals as short as one second in order to collect the small time scale turbulence and temperature fluctuations. The measurements were used to produce magnetic tape in the field in an ESL mobile laboratory.

Wind and temperature data were reduced to the form of mean values and standard deviations over various time averaging periods. Computer codes were developed to test relationships among the measured variables and to compute the Richardson's Number to understand the impact of measured variables upon stability of the boundary layer. The data were analyzed to study spatial and temporal variation of the gradient parameters and applications were made to trace the microscale air flow field over irregular terrain.

Study Title: . . . HIGHWAY AIR POLLUTION DISPERSAL USING TRACER GAS . . .

Sponsoring Agency: Environmental Protection Agency

Agency/Contractor (If Applicable):

Agency Contractor (Performing Monitoring): Environmental Systems Laboratory
Sunnyvale, California

Report:

ABSTRACT

ESL is currently under contract to the United States Environmental Protection Agency to perform extensive field measurements in order to characterize air pollution dispersal from highways. This very complex measurement and data reduction program, which will provide definitive data to public and private air quality modeling institutions throughout the country, is being performed in Santa Clara County, California. The program features the detection of controlled releases of sulfur hexafloride along with dispersal measurements of carbon monoxide; four sites near distinctly different single roadway types are being instrumented. Simultaneous air samples are taken at 10 spatially distinct locations and meteorological data at six simultaneous stations at each site. The meteorological data includes U.V.W. sensors at each station. Simultaneous measurements of wind shear, lapse rate, turbulence and other meteorological data were made at six spatially separated locations.

Study Title:	AIR, NOISE, AND TRAFFIC ENVIRONMENTAL IMPACT ASSOCIATED WITH THE DUMBARTON BRIDGE REPLACEMENT
Sponsoring Agency:	California Division of Bay Toll Crossings
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET39 July 1972

ABSTRACT

This initial study and its follow-on examined the air pollution, traffic, and noise impact to residential areas regarding the replacement of the Dumbarton Bridge; this highway would collect traffic diverted from the Dumbarton Bridge in the event of bridge replacement. Nitrogen dioxide, oxidant, and carbon monoxide concentrations were measured. Meteorological measurements and traffic measurements were also made. Validation experiments on carbon monoxide were performed in the vicinity of Highway 17.

The study indicated the traffic conditions, air quality and noise climate concerning the replacement. In particular, the relative community exposure to degraded air in the vicinity of the proposed western feeders to the bridge was evaluated for different feeder route plans. In addition, the study suggested a new alternate feeder route plan which would satisfy all of the air quality and traffic concerns.

Study Title:	VALIDATION AND APPLICATIONS OF AN URBAN DIFFUSION MODEL FOR VEHICULAR POLLUTANTS
Sponsoring Agency:	Coordinating Research Council and Environmental Protection Agency
Agency/Contractor (If Applicable):	Stanford Research Institute
Agency/Contracror (Performing Monitoring):	Stanford Research Institute
Report:	Atmospheric Environment, Permagon Press, Vol. 7, pp. 603-618, 1973

ABSTRACT

A practical, multipurpose urban diffusion model (APRAC-1A) has been developed and evaluated for predicting concentrations of inert, vehicle-generated pollutants. The model requires only routinely available meteorological and traffic data to give the following outputs: (1) areal concentration isopleths, (2) sequential hourly point values, and (3) frequency distributions. An extensive field experiment was conducted in San Jose to evaluate and refine all components of the model. A street effects submodel was developed to account for the high concentrations and large gradients observed in urban street canyons. Results are presented from a second experimental program conducted in St. Louis to further evaluate the performance of the model. Predicted and observed concentrations of carbon monoxide (CO) in St. Louis differ by root-mean-square values of the order of 3 ppm (parts per million), while frequency distributions of hourly concentrations are given within 2-3ppm. Along-street observations of CO concentrations show variations generally less than 1ppm.

In San Jose, measurements of CO were made at 5 levels on both sides of the street and at 5 points across each street. Two streets were studied. Three component winds were measured at roof level and at 4.5m. level on both sides of the street. In St. Louis, airport meteorological data were used and State Highway Department traffic data was used. CO data was collected on four streets.

Study Title:	STUDY OF AIR POLLUTION ASPECTS OF VARIOUS ROADWAY CONFIGURATIONS
Sponsoring Agency:	New York City Department of Air Resources and Environmental Protection Agency, Air Pollution Control Office and United States Bureau of Public Roads, New York Division Office
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	General Electric Co., Reentry and Environmental Systems Division, Philadelphia.
Report:	NTIS No. PB 211 235, September 1971

ABSTRACT

The study was undertaken to ascertain the current air quality in the immediate vicinity of various urban roadway configurations, to determine how the selected urban roadway configurations aid or hinder the diffusion of the pollutants emitted by urban traffic, and to develop mathematical relationships between traffic, traffic speed, pollutant concentration,, meteorological parameters and roadway configuration. There were 10 typical sites selected for monitoring. These sites were representative of open-cut roadways, tunnels, cantilever covered roadways, open roadways, and intermittantly covered roadways. Carbon monoxide was measured continuously at 16 different locations at each site. In addition a pooled hydrocarbon measurement was made from the 16 locations, and a particulate and trace metal measurement was made. Simultaneous meteorological measurements were recorded at two locations at each site, one location was usually on the median of the road being studied, the other location was at a higher location and away from obstructions to record general wind conditions in the area. The recorded information was wind speed, azimuth, elevation, azimuth sigma (standard deviation) and elevation sigma. Traffic volumes were obtained with pneumatic tube counters and multi-axle vehicles were classified as gasoline or diesel from visual observation. Traffic speeds were also recorded from stopwatch, radar, and pneumatic tube observations. At five sites indoor/outdoor carbon monoxide measurements were made. The indoor monitors were located in air rights buildings or nearby buildings. The report presents measured horizontal and vertical concentration profiles and a detailed discussion of the effects observed at each of the 10 sites.

Study Title:	**Not Available**
Sponsoring Agency:	**U. S. DOT, Federal Highways Administration**
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	**California Department of Highways**
Report:	**First report of progress not due at this time.**

ABSTRACT

There are no reports written regarding this major study which is just getting underway in March 1974. The scope and intent of this study are significant enough to warrant the attention of all those who are concerned with highway models. The information regarding this study is not complete but some of the salient features of the program are noted to inform the reader that a study of this magnitude is underway. The purpose of the study is to gather and record enough information to verify any mesoscale or microscale models available. Measurements of carbon monoxide, nitrogen dioxide, particulates and hydrocarbons will be made at different roadway configurations where the roadbed is below, above and at grade. Meteorological data will include 2 and 3 directional winds, 2 levels of temperature and relative humidity. Traffic data will be recorded using traffic radar and automatic traffic counters. Three complete mobile monitoring laboratories are being assembled in the early part of 1974 and will be in the field for monitoring work as soon as they are ready. The field data will be assembled for input to various dispersion models for model verification.

Under a separate study California Department of Highways is studying highway related pollutants with a large scale model which will allow modeling for corridor scale studies - and will include a photochemical model for study of oxidants. The model will be calibrated for Sacramento then used in other cities to verify its usefulness.

Study Title: AIR QUALITY MANUAL VOL. VIII

Sponsoring Agency: U.S. DOT, Federal Highways Administration

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring):

Report: Final Report to DOT on Contract DOT-FH-11-7730

ABSTRACT

This publication is included in this group of studies to insure reference to this major piece of work accomplished by the California Division of Highways. The series of publications is available from NTIS. The foreward to Volume VIII is reproduced to introduce the complete set of publications produced.

FOREWORD

A number of studies must be completed prior to the writing of an Environmental Impact Statement for a highway project. One of these studies is concerned with the gathering of field data, analysis of such data, and writing an air quality report.

The California Division of Highways has embarked on a program of equipping and training district personnel to prepare air quality reports. This required a two-week training course and the preparation of air quality manuals to be used as guides in the gathering of field data, analysis of results, and writing the report.

This volume is the first in a series of eight volumes, the titles of which follows:

1. Meteorology and its Influence on the Dispersion of Pollutants from Highway Line Sources.
2. Motor Vehicle Emission Factors for Estimates of Highway Impact on Air Quality.
3. Traffic Information Requirements for Estimates of Highway Impact on Air Quality.
4. Mathematical Approach to Estimating Highway Impact on Air Quality.
5. Appendix to Volume 4.
6. Analysis of Ambient Air Quality for Highway Environmental Projects.
7. A Method for Analyzing and Reporting Highway Impact on Air Quality.

8. Synthesis of Information on Highway Transportation and Air Quality.

The material presented in these volumes is subject to change as further research provides information. The following items are not discussed or, if presented, are subject to care in the interpretation of results.

1. There is no accepted emission factors for oxides of nitrogen relating emissions to speed.
2. There are no statistically validated photochemical models for different meteorological conditions which will permit calculations of oxidant formed downwind from a line source.
3. Further research is required to fully validate model calculations when winds blow parallel to the line source.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 6 - MAJOR HIGHWAYS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	ENVIRONMENTAL ANALYSES AND REPORT FOR ROUTE 18 FREEWAY EXTENSION, CITY OF NEW BRUNSWICK AND PISCATAWAY TOWNSHIP, MIDDLESEX COUNTY, NEW JERSEY
Sponsoring Agency:	New Jersey State Department of Transportation
Agency/Contractor:	King and Gavares, Consulting Engineers New York City
Agency/Contractor (Performing Monitoring):	General Electric Co., Reentry and Environmental Systems Division, Philadelphia, Pa.
Report:	July 1972

ABSTRACT

The air monitoring study was undertaken to assess the ambient air quality in the vicinity of a planned four-lane divided highway. The measurements were made on George Street parallel to the proposed route. Four carbon Monoxide monitors were used; two were located in dormatories and two were located outside. Wind speed, wind direction, and traffic were measured.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 4 - PARKING FACILITIES
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Preceding page blank

Study Title:	ENVIRONMENTAL IMPACT REPORT ON THE NORTH BAYSHORE REDEVELOPMENT COMMERCIAL RECREATIONAL PARK
Sponsoring Agency:	Private
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET31 December 1971

ABSTRACT

The Environmental Systems Laboratory prepared an environmental impact statement of a proposed Commercial and Recreational Redevelopment Project for the North Baylands area of Mountain View, California. The analysis conformed to the guidelines set forth by the National Environmental Quality Act as well as the California Environmental Quality Act. Both ambient air quality and noise levels were measured at several sites in the project area. Pollutants measured were carbon monoxide and nitrogen oxides. Meteorological measurements and traffic measurements were made. The analysis examined, in detail, the implications of the project to the community air quality and noise levels.

Preceding page blank

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 7 - RECREATION AREAS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	PRELIMINARY ENVIRONMENTAL ASSESSMENT OF THE HUNT VALLEY SHOPPING CENTER IN BALTIMORE COUNTY
Sponsoring Agency:	Private
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET69, November 1973

ABSTRACT

An environmental analysis was conducted for the Arthur Fischer Corporation, the developer of a regional shopping center in Baltimore County, Maryland. The principal issues investigated were impact on air, noise, and water. Air and noise issues were generated by the vehicular traffic attracted to the facility.

Special attention was paid to assessing the present air quality characteristics of the area and ascertaining what type of increment on air pollution would be caused by the traffic patterns generated at peak hours and the most critical eight hour period of operation of the center. Air quality, meteorology, traffic, and noise were monitored at a fixed station on site. Pollutants measured were carbon monoxide and oxidants. The air quality and noise measurement was supplemented by sampling meteorological conditions near the major roadway facilities feeding the center. This assessment allowed predictions of air quality to be made using actual on-site meteorological data rather than an extrapolation from the nearest airport.

Study Title:	VALIDATION STUDY OF AN APPROACH FOR EVALUATING THE IMPACT OF A SHOPPING CENTER ON AMBIENT CARBON MONOXIDE CONCENTRATIONS
Sponsoring Agency:	Environmental Protection Agency, Office of Air Quality Planning and Standards, Monitoring and Data Analyses Division, Sources, Receptors, and Analyses Branch
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	G.C.A. Corporation
Report:	A draft report is expected in March 1974

ABSTRACT

The purpose of the study was to attempt to validate the previously developed approach proposed by EPA for estimating the peak impact of a regional shopping center on ambient air quality in its immediate vicinity. The study was conducted at a large shopping mall in the two weeks preceding Christmas, 1973. Five continuous carbon monoxide analyzers were used, one located near the major gate and the others in selected locations within the parking lot. Meteorological measurements recorded included a continuous recording of wind speed and direction, surface temperature, and visual indications of stability such as cloud cover. Traffic measurements included continuous counting devices at all entrances and exits and spot checks of running times during congested and minimal use periods.

Preliminary reports of the results of the monitoring indicate that the concentrations of carbon monoxide were highest near gates with a highest recorded value of 30 ppm. Concentrations within the lot were reported to be always within the National Ambient Air Quality Standards. A draft report is expected in March 1974.

Study Title:	. . . AIR QUALITY IMPACT OF LARGE TRAFFIC GENERATING COMPLEX SOURCES . . .
Sponsoring Agency:	County of Milwaukee, Wisconsin
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	County of Milwaukee, Department of Air Quality Control
Report:	Interoffice Memorandum, September 21, 1973

ABSTRACT

The County of Milwaukee is faced with the question of where to locate a new sports arena. Impact on air quality is one of the criterion which will be considered in the decision making process. In order to evaluate the potential impact the County Department of Air Quality Control made on-site carbon monoxide surveys in May and June 1973 at:

a. The Milwaukee County Stadium
b. State Fair Park
c. Lakefront Parking Area
d. Southridge Shopping Center

The observations made indicated neither the 1 hour or the 8 hour standards were exceeded at any of the four sites. Sampling was done during peak Friday afternoon and evening shopping hours; on a Sunday afternoon when 10,366 arrived at the State Fair Park. Meteorological data was not collected. Carbon monoxide detector tubes were used which provided a six minute sample time. Traffic data is provided.

Study Title: . . . RALEIGH, NORTH CAROLINA SHOPPING CENTER AIR QUALITY MONITORING STUDY . . .

Sponsoring Agency: Environmental Protection Agency, Office of Air Quality Planning and Standards, Monitoring and Data Analysis Division

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring): Research Triangle Institute Research Triangle Park, Durham, N. C.

Report:

ABSTRACT

The study of carbon monoxide concentrations related to shopping centers was conducted in two phases. Phase I (January-February 1973) involved preliminary monitoring of carbon monoxide concentrations at five separate locations. Wind speed and direction were measured at one location in each center. Traffic counts were obtained at each location.

Phase II (February-March 1973) concentrated on one shopping center. Carbon monoxide concentrations were measured at four locations within the shopping center parking area and one location adjacent to a nearby highway. Maximum hourly concentrations and maximum eight hour CO concentrations are plotted for each of the five sites. Daily traffic counts were taken at four entrances to the shopping center and in one traffic lane within the center. No meteorological data is presented.

Study Title:	A MONITORING PROJECT TO EXAMINE THE RELATIONSHIP BETWEEN CO CONCENTRATIONS AND VEHICULAR ACTIVITY ASSOCIATED WITH COMPLEX SOURCES
Sponsoring Agency:	Illinois, Division of Air Pollution Control
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Illinois, Division of Air Pollution Control (DAPC)
Report:	Information on Proposed "Complex Sources" Regulation Sent to Illinois Pollution Control Board by DAPC on August 24, 1973

ABSTRACT

The Illinois Division of Air Pollution Control has conducted a series of air quality measurements at three shopping centers and a sports complex pursuant to obtaining information necessary to draft regulations regarding complex sources.

Data for these studies were collected during the peak traffic times for four days at each of the shopping centers and for one day at the Arlington Park Race Track. Data collected include ambient CO concentrations, wind speed and direction, and traffic data. Traffic data includes number of vehicles entering/leaving the facility, number of vehicles passing on adjacent roads, average speeds and distances traveled within the complex, etc. These data are and will be used to evaluate various approaches to determining the relationship between vehicle activity and CO concentrations. Two monitors were set up at each area; one at a place where heavy vehicular activity could be anticipated and another mobile monitor moved to locations in the parking lot as was judged appropriate. Data collected were reviewed from the standpoint of comparing those measurements at receptors subject to the roadway effect with simultaneous measurements at a receptor which was primarily subject to area-source influences. The data obtained show the roadway effect to be dominant therefore, the review criteria for the proposed regulation, used only to determine if a complex source is required to apply for a permit, are based on roadway effect considerations. Observed data were compared to air quality estimates made using (a) the Hanna Area-Source Model and (b) the HIWAY Model provided to Illinois DAPC by EPA. Some modifications to the HIWAY Model have been proposed. Data obtained from the monitoring studies were not given.

Study Title:	AIR QUALITY AND NOISE INPUT OF THE CAPITAL CENTER DEVELOPMENT, BOISE, IDAHO
Sponsoring Agency:	Boise Redevelopment Agency
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	

ABSTRACT

An eight-block downtown shopping center is proposed by the local Redevelopment Agency for Boise, Idaho. Since no air quality data exists for Boise, ESL has been meeting with regional and local EPA officials to draw up an air quality monitoring program which fulfills EPA requirements at minimum cost to the Redevelopment Agency. As well as air quality and noise monitoring, ESL is applying its computer models to predict future pollutant and noise levels in the vicinity of the shopping center area and throughout Boise. The resulting predictions will be the basis for design consulting to minimize adverse impacts.

Study Title: . . . AIR QUALITY IMPACT STUDY FOR EVERGREEN EAST SHOPPING MALL . . .

Sponsoring Agency: International Council of Shopping Centers

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitor): Environmental Systems Laboratory

Report:

ABSTRACT

In the Seattle/Tacoma vicinity an extensive air quality monitoring program has been conducted to compare predicted air quality with observed air quality to verify and adjust a diffusion model developed for predicting air quality impact of traffic at a shopping center. A proprietary model has been validated at an existing shopping center and will be used to estimate air quality impact of future shopping centers.

Hourly averages of carbon monoxide concentration were measured at 12 sites around a shopping center for 16 hours each day. Meteorological data were collected on site and recorded for input to this model. Model development work has been conducted under supervision of Dr. Rossano at the University of Washington. Air quality measurements have been made by Environmental Systems Laboratory, Sunnyvale, California. It was not known at the time of this writing if a report of this study will be released by the sponsor.

Study Title:	OAKBROOK, ILLINOIS, SHOPPING CENTER
Sponsoring Agency:	International Council of Shopping Centers, N.Y.C.
Agency/Contractor (If Applicable):	Barton, Aschman Associates, Inc.
Agency/Contractor (Performing Monitoring):	Environmental Technology Associates, Inc.
Report:	

ABSTRACT

The Oakbrook, Illinois, Shopping Center air quality monitoring study measured carbon monoxide at four stations. The measurements were made in the shopping center parking lot and at an adjecent intersection. Associated traffic counts were made. Wind speed and direction were measured at the parking lot. Atmospheric stability categories will be estimated from cloud cover and wind speed data. Publication date for the report is estimated to be May or June 1974.

Study Title:	AIR AND NOISE IMPACT OF ADDITIONAL DEVELOPMENT OF THE LLOYD CORPORATION PROPERTY, PORTLAND, OREGON
Sponsoring Agency:	Private
Agency/Contractor (If Applicable)	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET67, Vol. I, March 1973 (Vol. III to be published March 1974)

ABSTRACT

The Lloyd Corporation, owner of extensive property in downtown Portland, has planned several additions to its Lloyd Center, a large regional shopping center. In response to the Department of Environmental Quality (DEQ), a state agency, a comprehensive environmental statement is being written for all projected developments through 1980. Essential elements of this study are ESL's use of existing noise and air quality data in Portland, acquisition of a limited amount of new data, and prediction of future air quality and noise levels. The pollutant measured was carbon monoxide, meteorological and traffic measurements were also made.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 1 - SHOPPING CENTERS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to "collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources." The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of combining the numbers of cars operating, with a characteristic time of operation. Both of these parameters have characteristic and peak values depending on the type of source and its physical and operational characteristics; methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	CARBON MONOXIDE MEASUREMENTS IN THE VICINITY OF SPORTS STADIUMS
Sponsoring Agency:	Environmental Protection Agency, Office of Air Quality Planning and Standards Monitoring and Data Analysis Division
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Research Triangle Institute Research Triangle Park, Durham, N. C.
Report:	

ABSTRACT

The study was undertaken to obtain background data which would be useful in guaging the impact of sports complexes on ambient air quality. The data was also used to assess the performance of estimating methods proposed in the June 1973 Guidelines for Complex Sources. The monitoring was conducted during June and July of 1973 at the Atlanta and Pittsburg baseball stadiums. Seven days of monitoring were conducted at the Atlanta stadium which is in essentially flat terrain and four days of monitoring were conducted at the Pittsburg stadium which represented valley type terrain. In each stadium, three non-dispersive infrared carbon monoxide analyzers were set up upwind, downwind, and in the center of the stadium parking lot. In addition a series of 15 minute carbon monoxide grab samples were taken at four locations near major entrances during the period beginning one hour and fifteen minutes after the game. Traffic at four major entrances was recorded at five minute intervals during the same time periods and the time for randomly selected vehicles to enter and leave the parking lot was recorded. Meteorological measurements of surface wind speed, direction, and temperature were made within the parking lots.

Because of the relatively short time to fill or empty the parking lots the major air quality impact was on the hourly measurements. However, none of the observations indicated a violation of the one-hour NAAQS since the highest hourly concentrations observed were 22 ppm. in Pittsburg and 27 ppm. in Atlanta. A diurnal trend of background carbon monoxide concentrations not associated with stadium traffic was observed with the maximum concentration occurring between 0000 and 0600 hours. The eight-hour running average background concentrations nearly exceeded the eight-hour NAAQS of 9 ppm. during the early morning hours.

Although the number of observations are limited, a comparison of the observed and predicted values indicates that the proposed method for evaluating the maximum direct impact of complex sources on carbon monoxide concentrations appears appropriate for sports complexes. In all cases the agreement was within a factor of two and in most cases much closer than that.

Study Title:	TECHNICAL APPENDIX ___, AIR QUALITY AND NOISE IMPACTS FOR THE PROPOSED SANTA CLARA COUNTY SPORTS ARENA
Sponsoring Agency:	Santa Clara County, California
Agency/Contractor (If Applicable)	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET49

ABSTRACT

An environmental impact report (EIR) for the proposed Sports Arena was required in which three proposed sites were accorded equal and complete treatment. All three sites were within a triangle bounded by three heavily travelled highways.

For the air quality and noise elements of this study, ESL measured carbon monoxide, total and non-methane hydrocarbons, oxidant and noise at each site, meteorological and traffic measurements were also made. This data was related to historical data of the Bay Area Air Pollution Control District and to ESL's highway source model calculations, to characterize existing air quality and noise in the area. Predictions of future levels were then made based on future traffic, land use, and emissions. The EIR was submitted to the appropriate local agencies and jurisdictions. It is presently being employed in the decision on the final choice of site.

Study Title:	AUTOMOTIVE POLLUTION LEVELS NEAR VETERAN'S STADIUM
Sponsoring Agency:	Air Management Services, City of Philadelphia
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Air Management Services, City of Philadelphia
Report:	

ABSTRACT

This study of air quality related to traffic arriving and departing from a sports complex has not been written up as a report. The information was obtained from an informal memo sent by the sponsor. Air quality was monitored at one location for 12 hours before and after a football game with a sell-out crowd attending the game. Total hydrocarbons, methane, and carbon monoxide were measured on the curb at an intersection just outside Veteran's Stadium from noon to midnight on the day of the football game. Wind speed and direction data are provided. Automobile traffic counts are not provided but adjacent parking lot capacities are known (12,167 cars) plus on-street parking can be estimated. Observed concentrations of carbon monoxide during peak pregame and postgame traffic was 10 to 20 times that observed during afternoon traffic. Total hydrocarbon concentrations doubled during peak traffic periods and no noticeable change was observed with methane concentrations.

Study Title: . . . AIR QUALITY IMPACT OF LARGE TRAFFIC GENERATING COMPLEX SOURCES . . .

Sponsoring Agency: County of Milwaukee, Wisconsin

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring): County of Milwaukee, Department of Air Quality Control

Report: Interoffice Memorandum, September 21, 1973

ABSTRACT

The County of Milwaukee is faced with the question of where to locate a new sports arena. Impact on air quality is one of the criterion which will be considered in the decision making process. In order to evaluate the potential impact the County Department of Air Quality Control made on-site carbon monoxide surveys in May and June 1973 at:

a. The Milwaukee County Stadium
b. State Fair Park
c. Lakefront Parking Area
d. Southridge Shopping Center

The observations made indicated neither the 1 hour or the 8 hour standards were exceeded at any of the four sites. Sampling was done during peak Friday afternoon and evening shopping hours; on a Sunday afternoon when 10,366 arrived at the State Fair Park. Meteorological data was not collected. Carbon monoxide detector tubes were used which provided a six minute sample time. Traffic data is provided.

Study Title:	A MONITORING PROJECT TO EXAMINE THE RELATIONSHIP BETWEEN CO CONCENTRATIONS AND VEHICULAR ACTIVITY ASSOCIATED WITH COMPLEX SOURCES
Sponsoring Agency:	Illinois, Division of Air Pollution Control
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Illinois, Division of Air Pollution Control (DAPC)
Report:	Information on Proposed "Complex Sources" Regulation Sent to Illinois Pollution Control Board by DAPC on August 24, 1973

ABSTRACT

The Illinois Division of Air Pollution Control has conducted a series of air quality measurements at three shopping centers and a sports complex pursuant to obtaining information necessary to draft regulations regarding complex sources.

Data for these studies were collected during the peak traffic times for four days at each of the shopping centers and for one day at the Arlington Park Race Track. Data collected include ambient CO concentrations, wind speed and direction, and traffic data. Traffic data includes number of vehicles entering/leaving the facility, number of vehicles passing on adjacent roads, average speeds and distances traveled within the complex, etc. These data are and will be used to evaluate various approaches to determining the relationship between vehicle activity and CO concentrations. Two monitors were set up at each area, one at a place where heavy vehicular activity could be anticipated and another mobile monitor moved to locations in the parking lot as was judged appropriate. Data collected were reviewed from the standpoint of comparing those measurements at receptors subject to the roadway effect with simultaneous measurements at a receptor which was primarily subject to area-source influences. The data obtained show the roadway effect to be dominant therefore, the review criteria for the proposed regulation, used only to determine if a complex source is required to apply for a permit, are based on roadway effect considerations. Observed data were compared to air quality estimates made using (a) the Hanna Area-Source Model and (b) the HIWAY Model provided to Illinois DAPC by EPA. Some modifications to the HIWAY Model have been proposed. Data obtained from the monitoring studies were not given.

Study Title:	VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS SUBTASK 3 - SPORTS STADIUMS
Sponsoring Agency:	Environmental Protection Agency
Agency/Contractor: (If Applicable)	
Agency/Contractor: (Performing Monitoring)	GEOMET, Incorporated
Report:	Task Report under EPA Contract Number 68-02-1094 Task Order Number 3

ABSTRACT

The project consisted of a task, under a task order level of effort type of contract, to collect, analyze and integrate technical data, and develop methodologies which can be used to provide guidelines for EPA and state agencies in reviewing and evaluating proposed new or expanded complex sources. The principal technical effort involved quantitatively relating the physical characteristics of each type of complex source to automobile movements, numbers, and engine running times or speeds.

For the six complex source types which involve parking facilities (shopping centers, airports, sports stadiums, parking facilities, recreational areas, and amusement parks), the methodology involved developing the concept of complex, the numbers of cars operating, with a characteristic time of operation. Data on these parameters have characteristic and peak values dependent on the type of source and its physical and operational characteristics. Methods of calculation of appropriate values are given, to permit use in emission and air quality estimations.

For the seventh complex source (major highways), for which parking is not a factor, a different principle was developed for relating parameters descriptive of highway traffic to highway parameters. Briefly, one approximation technique which was developed, relates operating speed to design speed and the ratio of volume demand to capacity, and then evolves this into equivalent vehicle miles travelled. A more precise technique develops traffic density for specified highway segments, from volume demand and operating speed; emission rates can then be derived from consideration of unit emission rates, operating speed, and traffic density.

The seven methodologies have been used by EPA as the basis for guidelines which relate complex source characteristics to traffic behavior parameters (described above), thence to emissions, and finally to air quality estimates.

Study Title:	ENVIRONMENTAL ANALYSIS FOR COMMERICAL RESIDENTIAL DEVELOPMENT IN MONTGOMERY COUNTY, MARYLAND
Sponsoring Agency:	Private
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET70, November 1973

ABSTRACT

An air and noise pollution analysis was conducted for a proposed development of residential and commercial properties in an urbanized portion of Montgomery County. The analysis was performed for the specific requirement of an administrative zoning hearing held by the County. Air quality monitoring of carbon monoxide was conducted at selected sites on and around the proposed development area. Meteorological and traffic measurements were also made. Specific attention was paid to characterize the air quality from major arterials adjacent to the site. Prediction of air quality and noise levels was conducted using models that ESL has developed applicable to roadway sources. Major emphasis was placed upon relating the predicted air and noise levels to federal and state standards and in performing mitigating design which would alleviate potential problems.

Preceding page blank

Study Title:	AIR QUALITY AND NOISE IMPACT OF THE CAPITAL CENTER DEVELOPMENT, BOISE, IDAHO
Sponsoring Agency:	Idaho Department of Highways and the Department of Environmental and Community Services
Agency/Contractor (If Applicable)	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ETGD Vol. I, September 1973 (Vol. II to be published April 1974)

ABSTRACT

In the first major air quality monitoring program in Boise, Idaho, ESL is working with the Idaho Department of Highways (IDH) and the Department of Environmental and Community Services (DECS) to monitor carbon monoxide and meteorology. Information as to maximum and average CO levels is being measured to provide a basis by which IDH can evaluate the impact for several of its near-term projects.

The monitoring tasks include installation and maintenance of five stations monitoring ambient CO, lead, wind speed and wind direction. Of these stations one, centrally located, will be in operation for six months; the others will be operated in pairs for at least one month each. Continuous data will be supplemented by bag sampling near traffic sources and traffic counts will be made. The data will be reduced to one and eight hour values, and correlations between all stations will be computed. Meteorology from Boise airport (on a plateau above and about three miles from the central station) will also be included in the correlations.

As a result of this study, IDA and DECS are expected to be able to write and evaluate, respectively, air quality studies for most areas of Boise for near-term highway projects. The goal is a technical report which, combined with existing EPA publications and published tools, will allow them to accomplish this work.

Study Title:	AIR QUALITY AND NOISE IMPACT RELATED TO THE SALEM-PEABODY STUDY (Tasks A, B, and C)
Sponsoring Agency:	Massachusetts Department of Public Works
Agency/Contractor: (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	Task A, ESL-ET53, August 1973 Task B, ESL-ET54, August 1973 Task C, ESL-ET63, August 1973

ABSTRACT

The Salem-Peabody Study in Boston, Massachusetts comprised three separate efforts to provide a transportation plan for the area. ESL selected sites and monitored air quality, meteorology, traffic, and noise for all three efforts. Pollutants measured were carbon monoxide, total and non-methane hydrocarbons, and nitrogen oxides.

ESL staff met with EPA and Massachusetts Department of Public Works officials to discuss the impact found and produced technical reports detailing all work performed. Measures to mitigate adverse air quality effects were suggested.

Study Title: LEAD CONCENTRATIONS IN DETROIT, NEW YORK AND LOS ANGELES AIR

Sponsoring Agency:

Agency/Contractor (If Applicable)

Agency/Contractor (Performing Monitoring)

Report:

APTIC Abstract 10612L
Lead concentrations in Detroit, New York and Los Angeles air. Preprint, General Motors Research Labs., Fuels and Lubricants Dept. and General Motors Industrial Hygiene, Dept., Warren, Mich., 24p., 1968. 18 Refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 24-28, 1968. Publication GMR-773, Paper 68-90).

APTIC ABSTRACT

The concentrations of lead in air at 12 sites in Detroit, New York, and Los Angeles are reported. Sampling was carried out by filtration using a large "absolute" filter and equipment contained in a step-van truck. A portion of the filter was macerated in nitric acid and the lead determined spectrographically. The combined annual average lead concentration for four sites in metropolitan Los Angeles was approximately 40% higher than the combined averages of either the five sites in metropolitan New York or the three sites in metropolitan Detroit. Concentrations ranged from 0.4 micrograms/CU M at coastal Santa Monica, to 18.4 micrograms/CU M at a Los Angeles freeway interchange. Concentrations were generally highest in freeway areas, intermediate in commercial areas, and lowest in residential areas, and were about 40% higher in daytime than at night. Average lead concentrations were highest during autumn in New York and winter in Los Angeles reflecting an inverse realtionship with wind speed. Correlation coefficients between lead and carbon monoxide, at all sites, were statistically non-zero with 99% confidence, and varied from 0.75 to 0.96. Lead levels in road dirt were also measured and discussed. (Authors' abstract, modified).

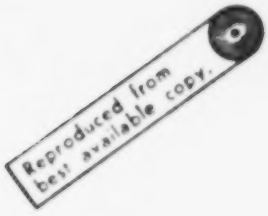
Study Title: CARCINOGENIC AIR POLLUTANTS IN RELATION TO AUTOMOTIVE TRAFFIC IN NEW YORK

Sponsoring Agency:

Agency/Contractor (If Applicable):

Agency/Contractor (Performing Monitoring):

Report: APTIC Abstract 11028L
Carcinogenic Air Pollutants in Relation to Automotive Traffic in New York. Preprint, General Motors Research Labs., Warren, Mich., Dept. of Fuels and Lubricants, RP-GMR-777, 32p., 1968. 33 Refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968. Paper 68-71.)



APTIC ABSTRACT

Sampling for particulates and carbon monoxide was carried out at [illegible] sites of certain polynuclear aromatic hydrocarbons (Benzo(A)pyrene and Benz(A)anthracene) to automobile traffic. Carbon monoxide and lead were determined as indicators of air pollution from automotive combustion sources. Sampling equipment was contained in a step-van truck. Particulate matter was collected on a large "absolute" filter. The benzene extract (tar) was analyzed for benzo(A)pyrene and benz(A)anthracene utilizing column and reverse-phase paper chromatography in combination with ultraviolet spectro-photometry. The average concentrations of all pollutants were highest at Herald Square in Central Manhattan, and lowest in suburban Sunnyside. Concentrations of benzo(A)pyrene ranged from 0.1 micrograms/1000 cu ft to [illegible] micrograms/1000 cu ft, were higher than at night, and were highest in autumn and winter. For all sites considered together, the correlation coefficient of benzo(A)pyrene with carbon monoxide was 0.65, with lead, 0.74, and vanadium 0.54; all three correlations were statistically non-zero with 99% confidence. At individual sites, however some of these correlation coefficients were significant and others were not. Benzo(A)pyrene, in air, even in areas of greatest automobile traffic, appears related with both automotive and non-automotive sources (space heating). Benzo(A)pyrene concentrations at the Manhattan sites in New York were lower than previously measured in central Detroit, even though traffic was greater at the New York sites. BAP in New York was lower than reported for most U.S. cities, and more than reported for several European cities.

Note: This Abstract was reproduced "as is" from the APTIC survey. The omission of the second line was missing from the Aptic Abstract when received.

Study Title:	THE AUTOMOTIVE CONTRIBUTION TO AIR-BORNE POLYNUCLEAR AROMATIC HYDROCARBONS IN DETROIT
Sponsoring Agency:	General Motors Research Laboratories
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	General Motors Research Laboratories Warren, Michigan
Report:	JAPCA 15(3) pp. 113-22 March 1965

ABSTRACT

The aim was to determine the contribution by automotive vehicles to the polynuclear aromatic hydrocarbons in city air. Sampling of particulate matter at the rate of 140 cu m/min 5000 cfm) was carried out at two heavily-trafficked sites in Detroit and one suburban site in Warren, Michigan. Carbon monoxide was determined continuously, and particulate matter was analyzed for "tar," polynuclear aromatic hydrocarbons, lead, vanadium, and sulfates. Polynuclear aromatic hydrocarbons in automobile exhaust gas are assumed to be dispersed in air along with carbon monoxide or lead from automobiles. It is further assumed that automobiles are the sole source of carbon monoxide and lead in the atmosphere. Concentrations of carbon monoxide and lead in exhaust gas and in the air are utilized to estimate the percentage of polynuclear aromatic hydrocarbons in the air attributable to automobiles. The mean automobile contributions to benzo(a)pyrene in the air, based on lead concentrations, were 18% at a freeway interchange, 5% in a downtown commercial area, and 42% in suburban Warren. The average concentrations of benzo(a)pyrene at the sites were 6 micrograms/1,000 cu m, 7 micrograms/1,000 cu m and 1 microgram/1,000 cu m, respectively. Mean contributions based on carbon monoxide concentrations were approximately twice the levels based on lead concentration Benzo(a)pyrene and benz(a)anthracene in air were not statistically related to carbon monoxide or lead in air, but were higher in winter than in summer, probably because of the higher levels of these materials emitted in space heating combustion in winter. (Authors abstract modified).

Study Title:	ENVIRONMENTAL ANALYSIS OF PROPOSED NEW YORK CITY CONVENTION AND EXHIBITION CENTER
Sponsoring Agency:	New York City Convention and Exhibition Center
Agency/Contractor (If Applicable):	
Agency Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-ET62, November 1973

ABSTRACT

The proposed Midtown Convention Center in New York City represents a project with potentially significant traffic related impacts. In the air quality study, ESL combined a monitoring program with statistical analyses of past air quality data in New York. The monitoring program measured ambient CO, NO_2, and oxidants. Meteorological and traffic measurements were also made. The monitoring program was also employed to calibrate ESL's urban street canyon dispersal model.

Predictions of future air, noise and water quality were calculated for both build and no build and for conditions leading to least, most probable, and greatest impact. For these conditions varying growth rates were assumed; in addition vehicle emissions were calculated for three different features of the emission control program. Material for the final environmental impact statement is being prepared.

Study Title: CARBON MONOXIDE DETERMINATIONS IN SUBTERRANEAN CARPORTS

Sponsoring Agency:

Agency/Contractor (If Applicable):

Agency/Contractor Performing Monitoring):

Report: APTIC Abstract 09010
Carbon monoxide determinations in subterranean carports. ((Kohlenoxidmessungen in unterirdischen autoeinstellhallen.)) Chfm. Rundschau (Solothurn), 17(2E):1-8, 1964. 5 references translated from German. Joint publications research service, Washington, D. C., R-8937-D, 13P., Jan. 12, 1968.

APTIC ABSTRACT

CO determinations with a recording infrared spectrograph are reported. The measurements pertain to ventilated garages and garages without ventilation systems in the city of Zurich. The CO concentrations in ventilated garages are in the average (for a 10-hour measurement period) below 60 cc CO/CU.M. Individual short-term peak values of more than 500 ppm could be occasionally observed. The values determined in an unventilated garage with approximately 70 to 90 parking spaces ranged in the average from 90 to 100 ppm and the peak values reached a height of more than 500 ppm CO. (Author's summary)

Study Title:	LINCOLN CENTER GARAGE ENVIRONMENTAL EXPOSURES
Sponsoring Agency:	Department of Air Resources, New York City
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Department of Air Resources, New York City
Report:	Interoffice Memorandum (Dept. of Air Resources, New York City)

ABSTRACT

On Thanksgiving Day, November 23, 1972 a number of people experienced symptoms of being overcome or were overcome due to exposure to high levels of carbon monoxide while sitting in their automobiles to leave the parking garage. The Department of Air Resources installed carbon monoxide monitoring equipment in the garage the following day to measure the CO levels in the garage. Data reported in the memo that was furnished showed a maximum 1 hour average concentration as high as 71-65 ppm. Data for other hours on Saturdays and Sundays showed 1 hour maximums of 46-42 ppm, and maximum 8 hour averages of 18-42 ppm.

The high levels of CO on the Thanksgiving Day weekend were attributed to traffic conditions on 65th street which did not permit automobiles to exit from the garage freely and thereby caused auto's to idle in the garage for long times. Also, possibly the ventilation system was not being used to its capacity.

Expected dosage levels to persons exposed to high levels of CO for short periods of time are given and comparison is then made in terms of the expected carboxyhemoglobin levels of the blood. Recommendations to avoid the high levels of CO in the garage in the future are listed.

8 - RESIDENTIAL DEVELOPMENT

Study Title:	DRAFT ENVIRONMENTAL IMPACT REPORT TO THE CITY OF MOUNTAIN VIEW SUBJECT: PROPOSED DEVELOPMENT AT 266 ESCUELA STREET
Sponsoring Agency:	Private
Agency/Contractor (If Applicable):	
Agency/Contractor (Performing Monitoring):	Environmental Systems Laboratory Sunnyvale, California
Report:	ESL-E145 March 1973

ABSTRACT

An environmental impact statement was written by ESL for a residential tract in Mountain View, California. Since the development was near U.S. 101, a major highway with a projected Average Daily Traffic of 185,000 vehicles, air quality and noise were the major issues. Both air quality and noise were monitored at the site during this project. The pollutant monitored was carbon monoxide. Meteorological measurement and traffic measurements were also made. ESL assisted the developer in designing a revised construction plan, in which houses will be built nearer the roadway as future emission controls take effect.